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PROJECT 105

MONTHLY PROGRESS REPORT NO. 2

1 November 1964

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Prepared by: [redacted]

Approved by:

Section Manager
Data Processing Section

COPY NO. 5

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Introduction

This report covers the present status of work accomplished on the 105 Program for the month of October.

During the month of October the design considerations have been consummated in a firm approach in most areas. Some breadboarding has been completed and tested, and in the remaining areas all drawings have been finished and released for fabrication. This period was concluded with a general progress review with the customer's technical representative here at [redacted] This report follows the basic configuration as established in the initial report with the addition of a list of all items which have been changed due to request since the initiation of the program. 25X1A

General Configuration

It is not anticipated at this moment that any major changes have or will occur in the overall initial external configuration, which were not reported last month. The original problem of meeting 6 chips per minute now seems to be feasible. However, this time requirement is still close, and we may be required to drop to somewhere between 5-6 chips/min, which we have been told would be acceptable. Therefore, the procedure outlined under magazine configuration will be followed. Individually all other design functions are being formulated with the exception of the chip ejection mechanism, which has been delayed due to lack of information we had expected to receive before the first of October. In order to alleviate this bottleneck, we will submit our proposal of an approach we believe to be extremely simple and in keeping with original concepts as discussed at our meeting in August. The overall basic console will probably be constructed in two basic units which visually look like one. This will allow us to isolate such items as vacuum systems, film drive, magazine, and actual chip mechanisms from the electronics, fluid pumps, etc, that may need cooling or have vibrating members, thus giving us better control during actual exposure. Resolution testing has definitely shown this to be extremely critical, and isolation of this form may be necessary to meet the minimum requirement of resolution.

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Magazine Configuration

Our approach to the overall magazine configuration is as discussed at the meeting here on October 28 and 29, evolving out of the concept of a vertically rotating wheel. Visualize this as something like a ferris wheel with four individual platens, at 90° increments, maintained on a fixed circumference during rotation, but being pushed out and pulled in as an operation is performed in each quarter position. Vertically, at the very top, will be the cassette magazine, which holds the unexposed raw chips. Upon command a chip will be ejected from the cassette onto the upper-most platen. Vacuum will suck it into position and verify it has seated correctly on the platen. The platen will now be pulled in toward the center and rotation will then take place through 90°, at which time the rotation will cease, the platen will be moved out to the Data Recording Position. At the completion of the data recording the platen will move back in and again rotate 90°. This in and out motion will be approximately 3/4". In station 3 the platen will again move out and make contact through the liquid gate with the film plate. The information area will now be exposed. The platen will again retract and rotate to station 4, where the fully exposed chip will be ejected from the rotating sequencing wheel.

Design has progressed to the point where it is safe to say it is not only feasible but, from a practical point of view, has lower inertias, less mechanisms, and is a considerable improvement over all past configurations. In the long run, this should be a saving in time and effort, which will allow us to make the required six chips per minute.

Breadboard drawings have been made for this entire area and have been released for fabrication. Completion of these components is anticipated by the end of this month, assembly approximately one week later, followed by final testing. This breadboard will include a liquid gate and be adaptable for various approaches. The initial concept of the liquid gate was designed so that the film goes through a continuous operating bath. However, it has been anticipated that an approach will be attempted to apply the liquid to the film by a flushing means, doing away with the continuous bath. This would solve considerable design problems, use less liquid, reduce the health hazard due to toxicity, make our venting problem less severe, and keep the film clear of solutions during rewind.

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Drive System

The drive system breadboard for the film transport has been completed. Testing has been conducted to check overall velocity control. Control, as expected, can be maintained smoothly from .1"/sec to 24"/sec. Additional components are under construction which will be added to this same breadboard to check the accuracy of positioning at the X-drives. This system is now being wired into this breadboard.

At the present moment no breadboarding is anticipated to be done on the y and azimuth drive systems as they are similar to the x which is considered to be by far the hardest to maintain for overall accuracy.

FILM RESOLUTION

Optical Configuration

Our optical testing program has produced some encouraging results. Initially tests were started using a 200 watt Osram lamp placed approximately 10" away from a resolution target held flat to a piece of diazo film. Note; Diazo film was utilized throughout the early part of these tests in order to give us better control over development and to give us a standard base to work with as we went through various films testing the effect of resolution because of film emulsion thickness.

Our primary objective was first to prove out the geometry of our system. Basically, it was originally assumed that an optical system was needed to give proper collimation required for high resolution. However, as the degree of collimation and the effect of angle substance of the light source required was not known, testing was established to evaluate these conditions.

Tests to date have produced results in excess of 500 lines/mm, using a filament of .080 X .025 and at an illumination throw distance of 10 to 80 inches with no apparent degradation in resolution on diazo. Coming inside of the 10" the drop in resolution becomes quite critical. Similar tests have now been conducted utilizing [redacted] film. At the moment we are achieving better than 400

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lines per millimeter on this film. However, this seems to be the limit.

Continued testing will be finished in the next two weeks, mainly to evaluate off axis (edge of the format) conditions. The hopes are that we will be able to achieve the required 400 lines. However, because of the extreme contrast range which is apparent throughout a resolution test target in the order of 500 lines, it should be noted, correct exposure is a very critical item.

Based on the above, the illumination system may, therefore, consist of a light source without optics. If an optical system were to be utilized, a high degree of collimation would still be required, but the greatest disadvantage would be that each dirt or dust particle on the surface of the mirror or lens and the glass envelope of the bulb would form a real image on the reproduced chip. The severity of these particles would be extreme, and therefore, if it should prove necessary for some reason at a later date to install an optical system, these problems will definitely add to the complexity of the overall printer.

Electronics and Systems Logic

The general design of the electronics for the system is showing good progress. The systems logic has been firmed up for approximately 90% of the system. However, during the October 28 and 29 conference here
25X1A [redacted] a considerable number of changes occurred. Also, there seems to be a slight amount of confusion about certain inputs. In order to rectify this situation, it was requested that we write up the procedures, we would prefer to have and the orientation requirements which should be presented to us on the input tape. This is being done and will be forwarded to the customer at the earliest possible date.

In the electronics area the control system for driving the film in the X-system has been breadboarded and finalized. Wiring is now under way on the breadboarding for exact positioning circuits. Breadboarding has also been accomplished for an automatic exposure control system. Preliminary testing on this has started. Systems logic for the data recording is in progress. However, because of the changes requested in the data recording area, this must be completely re-evaluated.

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Data Recording

Three items occurred last month to first give us a solution in the data recording approach and then finally the change in scope requirements presented at the October 28 and 29 meeting put us back where we had started. However, for completeness, the initial approach will be described, as it is anticipated at this moment that a version of the same approach can now be worked out to give us our final data recording procedure.

Because of the inherent restrictions placed upon us by design considerations, speed, and size, as reported in the first progress report, considerable problems were encountered in trying to firm up the data recording procedure. However, an attempt to utilize a high-speed typewriter which could produce a master type negative that could then be pulled quickly into position to record all data with one quick flash was investigated. This approach gave us two fundamental advantages over anything discussed previously. First, by making up a master negative at the time that the tapes were originally read, did away with electronic storage and, secondly, gave us a sufficient period of time so we would not interfere with the 6 chips per minute requirement. Also, now that the magazine sequencing wheel was vertical, we had sufficient room in this area for such a device.

A search was made of all existing commercial typewriter approaches. None were found applicable; however, a continuing search in the graphic arts field produced a number of machines which are now being built with features which could be utilized.

25X1A One of these, manufactured by [redacted] with certain changes, is being seriously considered. However, to make this system feasible, the material to be typed on must produce a clear character with a dark background, be extremely tough, not easily scratched, and sufficiently thin to easily roll and be transported. A number of specialized carbon papers were tried. None of these after being punched left a sufficiently good, clear character, and all easily marked. Fortunately a new conversion film called Cronapress, which is .002 thick and is manufactured by [redacted] was tried. Using this [redacted] film in the normal method would require altogether too long

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a period of time, as [redacted] normally requires dying, stabilization, and finalized drying. However, it was attempted to do the same without going through the dying process on a clear sheet. For our purposes results seem excellent. [redacted] consists of a mylar base with a surface of bubbles. When these are pressed, the bubbles collapse and make the background translucent. No residue is left to dirty or damage the mechanical operation.

Operational procedure would be as follows:

As the tape is read, a pulse will be supplied to the printing unit. The printing unit consists of a stepper motor which rotates a circular font upon which are placed the alphanumerical characters as required. The position of each individual character is recognized and maintained by a magnetic pickoff. As each character is called for by the tape, the wheel rotates within 50 m.s. to the desired position.
25X1A The [redacted] tape which is directly below the wheel has indexed into the proper position, at which time a hammer operated by a
25X1A solenoid compresses the bubbles on the [redacted] film, leaving the proper character. This process is carried on until a finalized master is completed. The master is then moved into position in the data recording chamber, at which time an individual flash reproduces the finished generated data on the final chip. Additional chips are made by repeated flashing.

Current Status of Work in Problem Areas

The current work being conducted on this program has now reached the phase where most approaches have been formulated. Some breadboarding has been completed and approximately 90% of all remaining breadboard parts are in fabrication. It is anticipated that fabrication of all parts will be completed during this month and final assembly of all breadboards should be complete around the 10th of December. Our major problem area at the moment is time. Unfortunately, with the amount of breadboarding required and the testing results that we need to complete during Phase I, we are running very tight to schedule. Until the changes which occurred at our last meeting with the customer, we had anticipated completion of Phase I for submission by January 15. Every attempt is still being made to hold this date.

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<u>Meetings with the Customer</u> 25X1A

Only one meeting was held with the customer during the month of October. This was at [redacted] on October 28 and 29. At this period of time a complete review of the entire 105 Program to date was conducted. The customer was presented with the results of our resolution testing accomplished in the processing group. Our present approach to system logic and electronics was outlined in detail and the complete mechanical configuration discussed. A presentation of our data recording approach was outlined and test results shown. Concurrence of our approach to date seemed satisfactory. It was requested, however, that we attempt to solve the liquid gate problem by flushing rather than a permanent cleaning bath. Thus, keeping the film free from liquid except when a chip was to be made.

<u>Projected Work for the Next Monthly Period</u>

The projected work for the next monthly period will be as follows:

It is anticipated that all component parts of the various breadboards will be finished and final assembly completed by the 10th or the 15th of December. Design will continue in all areas and by the latter part of this month into the control configuration and start of the external configuration. A more detailed investigation of the data recording area to solve new problems recently presented with the additional binary output will be conducted.

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APPENDIX A

Requested Changes to Date

The following requests have been made. Some of these are changes in scope, others are purely action items which will take place as the program progresses. These are listed below.

Item	Change
A	Request that the number of repetitive prints to be produced change from the original 15 to 99.
B	Change original number of 10 security classifications to a minimum of 50 and they would like to see 99.
C	Add a rear projection viewer of ten to fifteen power magnification to view the immediate area around the center of the format. The viewed area should be approximately 1/8 to 1/4 inch.
D	In order to take care of the conditions for a negative, which may have a 90% cloud cover with minute patches of detail showing, add an incorporate with Item C above, a separate photocell pickoff to determine exposure. This will incorporate and override the normal automatic exposure control to allow the operator to select either exposure by the auxiliary or automatic exposure control. It should be understood that an auxiliary exposure control of this sort would require some operator judgment.
E	Request that we propose an alternate method for placing the exposed chip in the processing chip holder and the chip holder in the processing magazine. This was not originally our concern. However, present approaches which have been presented are not satisfactory and deviate

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Item	Change
E (Cont'd)	drastically from discussion in August. We, therefore, will prepare a proposal on this item to be presented before November 20.
F	It has been stated that film to be delivered to us in the future for use in this machine will have a waxed coating. No major problems are anticipated in this area unless the wax contaminates the freons solution or the wax increases film thickness and thus handling ability. It is understood samples will be supplied to us in the near future.
G	We will check parity in both the longitude and traverse directions. Parity was not considered as part of the original proposal.
H	A request has been made to insure position accuracy of .01 millimeters when aligning fiducial marks under the magnifier of Item C. This does not mean that the system will have to respond to .01 millimeters on the tape control but only that, visually, when a man has established his cross hairs to his fiducial position he be able to control the servo in such a way that he can position the cross hairs visually to a position of .01 millimeters or .0004". This item may be a serious problem as it was pointed out that the original RFQ had asked for accuracy of 1 millimeter in 15 inches. Also, our proposal specified the 1 millimeter in 15 inches and a .1 millimeter of alignment between fiducials and center of registration. This is a factor of approximately 10. The implications of the above are not fully known at this time and are being investigated at the moment. Depending upon the breadboard results, this may or may not be a serious request.
I	Electronically several problems were encountered in the method in which information on the original tape input would be supplied. We will, therefore, write up the

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Item	Change
I (Cont'd)	procedure we would like to have supplied to the machine for operation and supply it for confirmation. Problems in this area will then be ironed out at a conference at a later date. Note: This discussion is included as Appendix B of this report.
J	We are to investigate the feasibility of a power drive for final positioning of the magazine rather than the original proposed manual control originally anticipated.
K	Investigate that a mechanical reset be added to the machine. That is, in case the magazine jams, power failure, or any one of numerous things which could happen, that the entire system could be reset back to start from scratch. At the moment it is not known whether this will be a necessary item or not. As presently envisioned this requirement may be successfully taken care of by an electronic reset previously censored.
L	We were informed and agreed that whenever two rolls of film are utilized, it will be the operator's function to decide which roll of film and how it will be combined with the tape input.
M	The lineup between the fiducial mark and the index mark may be to either the top or the bottom of each or either roll of film used in this system. This item becomes a clarification of intended use only and does not represent any physical change requirements not previously considered.
N	Requested that instead of utilizing the original 33-teletype asked for that the 35 ASR teletype be used.
O	Requested a complete change of data recording requirements, where we will maintain the same alphanumerical display originally requested, but will increase the binary output by double the alphanumerical display.

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Item	Change
P	Requested that the output which has been received from either of the two exposure control cells be displayed and that a series of buttons, each equivalent to a half a stop, with a total of three stops, be given so that the operator may vary his exposure in half stop increments from the normal exposure as displayed.

The following items were asked for previously.

A	Requested that the ASA standard code be used for data input and outputs. This presents no problem.
B	That a complete investigation and report be presented of the films that may be utilized with this printer.
C	To alleviate some of the confusion resulting from the original RFQ on footage of film. It has been stated that the film footage indicator be expressed in one-tenths of a foot. However, during actual positioning, that is, from the fiducial mark to a point of interest, all displays and units will be in millimeters.
D	A change in size of the original configuration asked for by us. That the original dimensions of 96" long by 36" wide be changed to allow the printer to be 40" wide; however, still holding the 36" width in a folded configuration so that it would still pass through a door. This has been verbally granted.

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APPENDIX B

Proposed Input

In order to simplify the input circuitry of the chip printer, and also to be able to present the accession number in any possible order, it is proposed that the input tape be preceded by the information required to operate the chip printer, then followed by the accession number. In this way the information in the accession number need not be finalized at this date and could be changed at any time without effecting any circuits in the Chip Printer Unit. The following is a proposed method of presenting this data.

Message Position	Message Symbol	Description
1	S_7	Information Separator
2	Plus or Minus	Sign of X position
3	number	Most Significant Digit (MSD) of X
4	number	Second MSD of X
5	number	Third MSD of X
6	number	LSD of X
7	S_7	Information Separator
8	Plus or Minus	Sign of Y position
9	number	MSD of Y
10	number	Second MSD of Y

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Message Position	Message Symbol	Description
11	number	Third MSD of Y
12	number	LSD of Y
13	S_7	Information Separator
14	number	MSD of Azimuth
15	number	Second MSD of Azimuth
16	number	Third MSD of Azimuth
17	number	LSC of Azimuth
18	S_7	Information Separator
19	number	MSD of the number that represents a security class
20	number	LSD of the number that represents a security class
21	S_7	Information Separator
22	number	MSD of the number of prints
23	number	LSD of the number of prints
24	CR	Carriage Return
25	LF	Line Feed
26	SOM	Start of Message
27 to 82	Alpha Numeric	56 Position Accession Number

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Message Position	Message Symbol	Description
83	CR	Carriage Return
84	LF	Line Feed
85 up to 152	Alpha Numeric	Up to 68 Machine Readable Codes Only
153	S_7	Information Separator
154	number	MPC Parity Check
155	number	MPC Parity Check
156	EOT	End of Transmission

The first 25 positions on the input tape will be used to control the Chip Printer. The 27th to the 82nd character (56 Alpha-numeric characters) will be printed in human readable form on the output film chip. The 26th to the 82nd will be printed in machine readable form. The 83rd and 84th characters will not be printed but will be used to control the teletype unit. From tape position number 85 on to position 152 (a maximum of 68 characters) the user could add machine readable codes only. If the user puts in a full 68 characters, then the 153rd character will be an information separator (S_7) symbol. This character will not be printed out on the output film. The 154th and 155th character will be the MPC parity check sum, which will be printed out. The 156th character will be the End of Transmission symbol, which will also be printed out. If the user had decided not to use the full 68 machine readable characters, then the tape position following the last character used will be the Information Separator symbol (which will not be printed out) followed by the two (2) MPC parity checks and the End of Transmission symbol.

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The American Standard Code, as shown in the attached sheet, will be used with an even parity conversion. As shown in the attached sheets marked X3.3.3, the American Standard Code specifies an even parity for punched paper tape.

The Teletype model 35AW, which has two sprocket feed paper tape readers beside the paper tape punch and the hard copy print out, will be what is required as the input device. This unit has an output of character parallel and will have separate punch and reader operator controls.

Film Positioning

The X position will have a + or - sign conversion, which will indicate positive (+) going to the right of the fiducial and negative (-) going to the left of the fiducial. The Y value will be measured negative (-) going down from the top fiducial and positive (+) measuring up from the lower fiducial. When working with the 5 inch or 70mm two channel condition, it will be the responsibility of the operator to position the chip magazine over the proper channel and to the proper upper or lower fiducial, then press a button to indicate which channel the measurement will be made on. If two measurements are to be made on the same frame using the same starting fiducial, then the operator would continue his operation without having to reset his counters or realign his starting point.

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X3.3.3/5.
April 7, 1964

TASK GROUP DOCUMENT

X3.3.3

WORKING PAPER

Character Structure for Serial-by-Bit
Data Transmission in the American Standard Code for
Information Interchange

Prepared By:

Task Group 3

Data Transmission Formats

Subcommittee X3.3 on Data Transmission

ASA Sectional Committee X3 on Data Processing Standards

DRAFT 1

April 1964

3.3 Character Parity Sense

3.3.1 Media Characteristics and Requirements

3.3.1.1. Punched Paper Tape

The proposed American Standard Perforated Tape Code for Information Interchange (X3.2/16-Dec. 19, 1963) specifies even parity per character so that the NULL and DELETE characters retain the all "0"'s and all "1"'s combinations respectively, including parity.

It is expected that even parity will be used in Edged Punched Cards for the same reason.

3.3.1.2 Magnetic Tape

The proposed American Standard-Recorded Magnetic Tape for Information Interchange (X3.2/73, Jan. 31, 1964) specifies odd parity so that the NULL character may be recorded on magnetic tape.

3.3.1.3 12-Row Punched Cards

The representation of ASCII in punched cards is still under consideration and as yet there are no parity requirements in 12-row punched cards unless it is decided that ASCII be represented in direct binary. In the case of direct binary representation of ASCII in punched cards even parity would be required, for the same reasons as in Section 3.3.1.1, to handle the NULL and DELETE characters.

American Standard Code for

Information Interchange

1. Scope

This coded character set is to be used for the general interchange of information among information processing systems, communication systems, and associated equipment.

2. Standard Code

b_4	b_3	b_2	b_1	b_7 0 b_6 0 b_5 0	b_7 0 b_6 0 b_5 1	b_7 0 b_6 1 b_5 0	b_7 0 b_6 1 b_5 1	b_7 1 b_6 0 b_5 0	b_7 1 b_6 0 b_5 1	b_7 1 b_6 1 b_5 0	b_7 1 b_6 1 b_5 1
0	0	0	0	NULL	DC_0	ƀ	0	@	P	UNASSIGNED	UNASSIGNED
0	0	0	1	SOM	DC_1	!	1	A	Q		
0	0	1	0	EOA	DC_2	"	2	B	R		
0	0	1	1	EOM	DC_3	#	3	C	S		
0	1	0	0	EOT	DC_4 (STOP)	$	4	D	T		
0	1	0	1	WRU	ERR	%	5	E	U		
0	1	1	0	RU	SYNC	&	6	F	V		
0	1	1	1	BELL	LEM	(APOS)	7	G	W		
1	0	0	0	FE_0	S_0	(	8	H	X		
1	0	0	1	HT / SK	S_1	)	9	I	Y		
1	0	1	0	LF	S_2	*	:	J	Z		
1	0	1	1	VTAB	S_3	+	;	K	[		
1	1	0	0	FF	S_4	(COMMA)	<	L	\		ACK
1	1	0	1	CR	S_5	−	=	M	]		①
1	1	1	0	SO	S_6	.	>	N	↑		ESC
1	1	1	1	SI	S_7	/	?	O	←		DEL

3. Positional Order and Notation

Standard 7-bit set code positional order and notation are shown below with b_7 the high-order, and b_1 the low-order, bit position.

	b_7	b_6	b_5	b_4	b_3	b_2	b_1
EXAMPLE: The code for "R" is:	1	0	1	0	0	1	0

4. Legend

NULL	Null/Idle	DC_1-DC_3	Device control
SOM	Start of message	DC_4(Stop)	Device control (stop)
EOA	End of address	ERR	Error

Legend continued on following page

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Proposed Chip Ejection Mechanism and Processing Magazine Loading
Item I, Appendix A of Monthly Progress Report #2
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PROPOSED CHIP EJECTION MECHANISM AND PROCESSING MAGAZINE LOADING

See Dwg # 1137L-5

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The proposed chip ejection method is illustrated in the enclosed illustration, [redacted] No. 1137L-5.

As the chip is brought to the ejection station by the platen on the sequence wheel, the platen is pushed forward. The platen vacuum is now released and light air pressure pushes the chip away from the platen into the clamping track. One side of the track now bends in to hold and places a slight curve in the film. The film is now held by its top and bottom edge, and is free to move along the track.

Directly behind the clamping track is a rotating belt upon which is mounted the film pusher. The pusher is now brought into contact with the edge of the film and pushes it forward into an individual chip processing holder.

The processing holder section is an open container in which individual chip holders may be dropped (maximum capacity 36 holders). A drive screw pushes all holders to a front position ready to receive the chip and holds this position.

As the chip is firmly placed in its holder, the holder, in turn, is pushed back into the bottom of the processing chip magazine.

Note: It is assumed that the magazine can be loaded in this method based upon previous discussions. Therefore, a method of pushing the individual chip holds up into the magazine is suggested, however, if the device which normally does this is satisfactory, it will be used instead. Some liaison will be needed in this area to resolve this interface.

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Proposed Chip Ejection Mechanism
and Processing Magazine Loading
Item I, Appendix A of Monthly
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PROPOSED CHIP EJECTION MECHANISM AND PROCESSING MAGAZINE LOADING (Contd)

When the chip holder is properly positioned, a cam actuated arm pushes the holder back into the magazine and holds it waiting for the next holder to be inserted. Meanwhile the clamping and drive arm has repositioned for the next cycle.

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Proposed Data Recording
Item O, Appendix A of Monthly
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DATA RECORDING

As the tape is read, a pulse or pulses will be supplied to the Printing Unit. The printing unit will consist of a stepper motor rotating a circular font upon which are placed the alphanumerical characters as required. The position of each individual character is recognized and maintained by a magnetic pickoff. As each character is called for by the tape, the wheel rotates to the desired position. The 25X1A [redacted] tape which is directly below the wheel has indexed into the proper position, at which time a hammer operated by a solenoid 25X1A compresses the bubbles on the [redacted] film, leaving the proper character. This process is carried on until a finalized master is produced.

This same master is now indexed to a second printing station consisting of a hammer plate and nine individual hammers. As binary information is read in by the second tape reader the binary code is produced on the same master by proper selection of the correct hammers.

The finished master is now moved into contact with the chip in the data recording position. At the proper moment a contact print is made by one single flash.

The following items will be required to increase the number of human readable characters to 56 and machine readable characters to 128.

[redacted]

Proposed Data Recording
Item O, Appendix A of Monthly
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DATA RECORDING
(Cont'd)

1. Interface electronics between the teletype unit and the high speed printer for two different print cycles.

2. Controls for operating the two separate tape readers.

3. Parity checking (by character).

4. Electronic control of the binary character code.

5. One additional Tape Reader to be tied in with the Teletype.

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Proposed Magnified Image and
Photo-Cell Pickoff
Item C, D and P, Appendix A
of Monthly Progress Report #2
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MAGNIFIED IMAGE & PHOTO-CELL PICKOFF

A rear projection viewer of approximately ten power will be attached to the front of the magazine. This viewer will project when properly positioned in an area of 1/8—1/4 inches of that area selected.

Combined with this viewer directly above the microscope objective will be a beam splitter which directs a portion of the illumination to a photo-cell, which will measure and establish the correct exposure for that area.

On the main control panel will be 8 switches. One to switch the exposure control system from the automatic exposure control photocell to this auxiliary photo control. One to allow the exposure system to read the normal exposure from either system used. Three switches each calibrated in 1/2 stop increments to adjust exposure from the normal by ± one and one-half stops.

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Proposed Parity
Item G, Appendix A of Monthly
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PARITY

In order to perform the function of checking the parity check sum (MPC) at the end of the transmission, it will require the following components.

1. 8 flip flop stages
2. 8 sets of "AND" gates
3. 8 bit storage register
4. Comparison Circuit
5. Counter to determine when the MPC data is present.

It is planned to count the proper number of S_7 symbols until the MPC data is present. This number will then be transferred into a storage register. The 8 flip flop stages will examine the 8 channels of data code storing for each character whether there is a bit present or not. At the end of the transmission this number will be compared to the stored check sum number, if these numbers are the same the operation will continue if they are different a parity alarm will be given.

Each character will be given a check for parity. This parity circuit will require the following components.

[redacted]

PARITY
(Cont'd)

15	"AND" gates
6	"OR" gates
8	Amplifiers

A parity check will be made when data is entered into the system and when the characters are printed out.

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[redacted]

Proposed Magazine Drive
Item J of Appendix A of
Monthly Progress Report #2
1 November 1964

MAGAZINE DRIVE

The magazine drive would consist of a motor, lead screw, and control system to move the magazine from its rear position to the printing station.

Our feelings at the moment are that this item does not enhance the operation of the printer because:

(a) Unit can easily and quickly be moved into position.

(b) Appropriate safe guards will be built in so that with a minimum of care, operator cannot damage unit.

(c) Speed of positioning by hand will be much faster.

However, we have no objections to including this item if necessary and it is priced out accordingly.

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Proposed Security Classification
Item B, Appendix A of Monthly
Progress Report #2
1 November 1964

What for?

SECURITY CLASSIFICATION

In order to increase the number of security classification from 10 to 99 types it will require the addition of the following electrical items.

1. An optical code reader.
2. Addition of stages in the storage register.
3. Special BCD coding to be added to the roll of film holding the security classifications.

It is planned to read the BCD code from the roll of film which stores the classification codes. This number will be compared to the stored requested number. A motor will be driven until these two numbers agree.

Functionally, a separate transparent belt will have the security classification printed on it. A motor drive will wind this from a supply spool across the chip format to two (2) take-up spools by changing the direction of the motor. This master may be driven in either direction. Security classifications will be placed in dual groups of approximately 10 classifications each (dual one for each side of the chip). There may be numerous groups of 10 each.

When the master tape has been positioned to the correct group and proper classification, a contact print is made to the required chip.

File

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PROJECT 105

MONTHLY PROGRESS REPORT NO. 1

1 October 1964

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Prepared by [redacted]

Approved by [redacted]

Section Manager
Data Processing Section

COPY NO. 4

LOG NO. 105-64-13

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[redacted]

Monthly Progress Report No. 1
1 October 1964

Introduction

This report covers the present status and work accomplished to date on the 105 Program.

A complete investigation has been conducted on the approach as presented in the basic proposal, every attempt has been made to insure that all functional outputs would remain as originally proposed, while at the same time insuring that all approaches were technically sound and could fully meet all requirements of the proposed RFQ.

General Configuration

Design consideration and basic details will, by necessity, change a good deal of the original appearance. However, at the present moment, the final appearance is not and until some later date will not be known.

A study of the overall time cycle; i.e., based upon the original approach soon showed that the ability to produce ten chips per minute ~~second~~ became highly improbable. When it was considered that the film would be picked-up by a vacuum platen then transversed a specific linear distance, then lowered to the printing stage, an exposure made, then raised to the data printing stage, exposed and finally ejected and then required for the platen to move back to the pick-up magazine. This transport time alone produced fantastic acceleration and deceleration . If exposures alone required a maximum of two seconds each, this allowed only two seconds for all of the above requirements.

On the basis of this investigation, it soon became evident that any approach taken would require time sharing in order to meet the specification.

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A secondary approach was investigated wherein the chip would be ejected from the magazine into a continuous track and then cupped, the edges of the film were then utilized as a bearing surface and the film was pushed from position to position by a continuous belt with fingers. In this manner if repetitive exposures were required, numerous prints would be in various handling stages at one time.

However, the above approach does not allow for a simple or quick method in which to position the film as required during exposure. Furthermore, all forms of complications occur when the required rotation must be accomplished. Minimum testing also showed doubtful results with .003 film.

In an attempt to satisfy the shortcomings of this system, the bent film with the moving belt was replaced with a moving shuttle, therefore, maintaining the film under a more exact control as it was moved from position to position. The shuttle would then be positioned to receive the film, it would then transport it to the printing station where the vacuum platen picked up the chip, push it through the shuttle, rotated, and then made the exposure. The chip was then brought back through the shuttle, held above the shuttle until it returned to pick up a new film and the exposed chip was then dropped into the second tray of the shuttle. As the shuttle then moved back to the exposure station, the exposed chip was passed to the data recording station and the same cycle occurred there.

The above, however, still failed to meet the overall required time cycle and with the additional responsibility which occurred at that time of indexing to one of three possible centers, at least twice per cycle made it even more impossible.

A careful analysis of the probable time requirements in all of the above systems showed that too many functions were and had to occur in sequence and a different configuration, therefore, had to be considered which would allow for better time sharing.

By removing the rotation for azimuth from the magazine section and placing it in the console, considerable time could be saved. Also, this left the magazine free for a completely different and much simpler approach. Repetitive exposures could now be made without setting rotation and derotation fifteen (15) times during the same period. The same also can be said with regard to the indexing to various centers. Thus, in each one (1) minute operation, two (2) functions now occurred, rather than sixty (60) times with there accompanying savings in cost, complexity, and reliability.

Magazine Configuration

The mechanical structure of the magazine has gone through an evolution similar to that of the entire machine. Some of this has been discussed in a previous section. The final configuration is still in doubt due to the data recording approach not being finalized at this time.

General Operation

The operator will move his film upon selection of the desired frame to the required fiducial location. Once he is there, by pushing his tape start button the film will automatically position to the required X-Y and azimuth coordinates. He then may, if required, view exactly what he will print out, as it will be masked in the final print. Once this position has been obtained and he is satisfied that this is the area that is required to print, he then must reach back and pull the magazine into position which automatically will lock in the proper spot for registration between display image and print image. Having selected the desired number of prints, he now pushes the print button and the remainder of the operations becomes automatic.

As currently envisioned the magazine consis t of a cassette containing initially all 500 chips which may be removed from the magazine at any time for loading or for separate storage. When the chip cassette is placed in the magazine it will be locked automatically into position with appropriate spring pressure being applied. Individual chips are then selected and taken from the cassette one at a time by an automatic mechanism which ejects the chip into a large rotating wheel. The wheel cons ists of four individual slots or holders spaced at 90° intervals. Upon receipt of the individual chip the big wheel rotates 90° to the printing station. As the wheel comes to rest a platen directly above this station comes down in contact with the film chip, registers it and by vacuum sucks the film to the platen holder. The platen holder then continues down pushing the chip and its holding mechanism out of the way and moves the chip through the liquid gate to the film below. Exposure is then made. Exposure will take approximately two seconds. At the completion of exposure the platen lifts and air is blown to break the seal that has been formed between the chip and the film below. As the platen lifts air is passed across the front of the film chip in order to dry and clean it. The platen now carries the film chip through the wheel above allowing two doors to swing closed below to hold the chip as it is released from the platen mechanism back into its holding position in the wheel. At the completion of this period, the wheel again swings 90°. At the third stage data recording is applied. At the completion of the data exposure the wheel rotates again 90° to the ejection stage. If the mechanism to be furnished to us remains as described, we will simply drop the chip into it here. When the

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1st chip is being ejected, the 2nd is in the data stage and the 3rd is being printed while the 4th is being ejected from the magazine into the rotating wheel. Each position of the wheel remains for approximately four seconds. Rotation for each stage is anticipated to be one-half second. Total time now is 17.5 seconds for the first prints with one every 4.5 seconds thereafter or a total of 10 in 58 seconds.

Drive System

The various drive system for X-Y and azimuth which originally were anticipated utilizing a stepping motor approach has been discarded due to present loads, inertia and speed of transport required. No stepping motor is available at this time. However, stepping motors could be utilized for both the Y system and possibly the azimuth. Recently, on a program we referred to as IIC we developed a drive system which gives us a velocity control of approximately .1"/sec. to 30"/sec. This was demonstrated to

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the Tech. Rep. here at [redacted] This drives in its present form is a velocity servo and will require some redesign to become a positioning servo. A breadboard has been designed, is now under construction and should be in full operation within the next two weeks. This type of drive system consist of a torquer mounted upon each individual spool. The torquers are driven in opposite directions by an applied voltage which keeps a constant tension upon the film at all times. When it is required to move the film in either direction the voltage is removed from one torquer while at the same time it is increased in the other one. This allows a very smooth action over the entire range of film velocities without the normal clogging which is generally presented in most systems, especially at low speeds.

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Film Resolution

Optical Configuration

A general investigation has been started on the overall optical and film problems. Although the original RFQ requested the use of [redacted] film, it is now understood that this was to be an example of a type rather than the film to be utilized. Therefore, in line with the customer's requests we have started an investigation of various films which may be utilized with this piece of equipment.

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At the present time various film manufacturers are being briefed on probable films which may be utilized on [redacted] A testing program has also been initiated in our processing section to determine the sensitometric requirements to insure that not only will we meet the resolution requirements of our RFQ, but also that the gamma, contrast range and general latitude of the films will produce the type of tonal range required for good reproduction. In the same department tests are also being run with diazo to determine the light source and angle of source required, and the limitations which must be imposed upon the optical system to insure 400 lines/mm output.

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The requested [redacted] film of [redacted] we understand has been dropped from their line. This has been replaced by [redacted] which now has become [redacted] Previous work done here with 105 film shows a gamma curve so straight that only four (4) individual steps are generally produced from a step wedge under normal conditions. This would give practically a black and white reproduction thus losing a good deal of the detail which will be required for the final reproduction anticipated. [redacted] work in the past with this film shows that this range can be expanded (drop in gamma) by utilizing of various developers.

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This testing is still in the early stages and our inputs so far have been light. Along with this a literature search is being conducted on high resolution parallel light contact printing. However, it seems little has been published on this subject.

Electronics and System Logic

Although at the present moment the electrical people are somewhat hampered by not having a finalized mechanical sys tem to work with there is still a great deal of work being accomplished without this. At the present moment most of the external logic has been worked out. This consists of a basic block diagram showing the entire electrically logical system. This has been broken down from that point into individual logic diagrams including:

a. Input Circuit Diagram
b. Program Control Unit Logic Diagram
c. Servo Control Logic Diagram
d. Initial Film Drive System Functional Block Diagram
e. Accession Number Generator Block Diagram
f. Automatic Memory Exposure Control System

As all of these are preliminary, nevertheless they are the basis and background about which the remaining system will be built. Selection of the exact component to be will be utilized in the finalized system are being tabulated. A good deal of this will be ready for review at our next meeting with the customer as anticipated in the middle of next month.

Data Recording

Various approaches have been considered in the data recording section. These include:

1. A rotating drum
2. A sliding bar approach
3. A CRT approach
4. A solid state transistor
5. Numerous mechanical-optical font approaches
6. Various contact printing approaches utilizing a generated master negative. For various reasons most of these have been dropped either because of size, complexity or anticipated poor results.
7. Various searches have also been conducted throughout the graphic arts industry.

Because of the various requirements of this program X, Y, azimuth, clear viewing area, liquid gate, etc. It is almost impossible to locate any data recording system in the main console below the film without the additional requirement of moving the chip some distance in order to expose data. If, however, the data recorder is placed in the magazine it increases size and we must either record through the chip base or raise the chip high enough above the film plain to exposure under it. All of the above places serious limitations on most systems encountered to date. Investigation is continuing in this area and a finalized approach has not yet been selected.

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Current Status Of Work and Problem Areas

Current status of all work being conducted on this program is still exploratory. Fortunately, a sufficient amount of this has been done so that design has started to evolve from the boards. The basic mechanical construction of the basic console is well under way. Some breadboarding has been started on the drive systems. Breadboarding will start on the liquid gate within the next month. Breadboarding of optical considerations is under way. The problem areas encountered have already been outlined in previously mentioned parts of this report. The only other problem area where serious trouble has been encountered during the past three months has been in the area of security which has been so strict on this job that Phase I has been seriously hampered by a lack of cleared people. Our security people have been notified of this as well as our customer. Every attempt, has been made to find a solution to this problem. Fortunately, during the last four weeks a number of these have been granted so that work for that period of time has been reaching a much higher level than previously. On the basis of this clearance delay some slippage will probably be necessary in Phase I.

Meetings With Customer

A number of meetings have been conducted with the customer. The first meeting was primarily arrange so the interface between
25X1A [redacted] and the processor could be worked out. The agreement was left here that the other processor contractor would supply us with working drawings for out interface requirements within a month period. This was to be supplied to us on or about the 1st of October. Primarily, we would take a shuttle furnished by them to us, drop our final chip into the shuttle which would store the chip in individual frames. We would also furnish a pulse telling when the chip is in the shuttle and sufficient vacuum upon command to

make this system work along with appropriate electrical connections. We would have to insure that the chip we had exposed reached this shuttle unscratched, or damaged in any way.

The second meeting was conducted at the same time without the other subcontractor being present. At this time it was pointed out that because of the requirement of three individual chip formats the pictorial area that would require positioning to the exact optical center of each one of these individual chip formats. This would require individual indexing which would occur at least twice for each individual chip. We, therefore, asked if this requirement could be passed back to the customer whereby the initial mensuration could mathematically add the individual displacement onto the supplied tape. It seemed at that time this could be done. However, we were later informed that this could not be done and this particular application had been passed back to us.

During the same discussion there was some doubt in our minds about the RFQ requirement of reading actual footage both in frames and millimeters. There intentions were explained to us regarding this and by mutual discussion was resolved the following way. The footage counter will not read individual frames as numbers but will read actual feet.

The Tech Representative has also requested that the ASA standard code be utilized in the system. A thorough investigation of this standard has been investigated here and presents no technical difficulties or added scope. However, the request for parity is an additional scope item not formerly considered.

Since that time by phone or direct contact other questions have been discussed. Most of these have resolved themselves by simple discussion. There is one, however, which should be noted. The original specification asked for a machine of 96" long, 36" wide so that it would pass through a door. We have asked for a spec deviation on the 36". We will still adhere to the 36" in a collapsed form, so that it can easily pass through a door, but we would like the perrogative of building a machine which will expand to 40" after passing through the door. This has been verbally granted. We also have been asked to do a thorough investigation of the films that might be utilized with this machine and the conditions effecting these films. This has been discussed in the optical considerations.

Projected Work for Next Monthly Period

The projected work for the next monthly period is to conduct the investigations now under way and carry them as far along as possible. At the same time to continue on with the design. Further, to construct those appropriate breadboards that need verification or understanding. This includes the film drive and mensuration system and following this will be a construction of a liquid gate which is to be utilized on the final machine. Later to the same breadboard will be added a simple magazine movement at the top which will illustrate both the programming and our approach of picking up individual chips and transferring them from spot to spot. That will complete our breadboard effort with the exception of possible tests that will be done on the optical configuration. These may or may not be combined with the original breadboard. This will be an automatic exposure control system breadboarded only to prove our exposure range considerations. It is not anticipated that the overall optical system will require a breadboard.

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